



National Aeronautics and
Space Administration

John C. Stennis Space Center
Stennis Space Center, MS
39529-6000

SCWI-1840-0003 Rev. A-1
January 2021

COMPLIANCE IS MANDATORY

John C. Stennis Space Center Occupational Exposure Assessment and Management Program

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SUBJECT: Occupational Exposure Assessment and Management Program		

Approval/Concurrence

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1-27-2021
Date

Document History Log

Status/Change/ Revision	Change Date	Originator/Phone	Description
Basic	02-04-2016	Rachel Cranford 8-3173	Initial Release
A	01-29-2021	Michael Pannell 8-2555	Five year review. Updated formatting and grammatical errors, and references.
A-1	1-29-2021	Michael Pannell 8-2555	Error on document date corrected.

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1.0 PURPOSE

This John C. Stennis Space Center (SSC) Common Work Instruction (SCWI) provides direction for development, management, and implementation of the SSC Occupational Exposure Assessment and Management Program.

It is the policy of SSC to provide employees with an environment in which occupational health hazards are identified, evaluated, and eliminated or controlled in such a manner that personnel do not suffer adverse health effects as a result of their employment. Activities shall be conducted in a manner that conforms to all applicable federal, state, and local regulatory requirements. Exposure to chemical and physical hazards will be managed to ensure they are below exposure limits and as low as reasonably achievable.

2.0 APPLICABILITY

This SCWI applies to the National Aeronautics and Space Administration (NASA) and NASA Contractors at SSC and at SSC-controlled offsite operations.

3.0 BACKGROUND

Occupational exposure limits are based on available toxicology and epidemiology data to protect workers over a working lifetime. Exposure assessments in occupational settings are performed by industrial hygiene professionals who gather relevant information and data related to workers, agents (chemical, physical, or biological) of concern, materials, equipment, and available exposure controls.

The risk that an employee faces on the job is a function of the hazards present and his/her level of exposure to those hazards. Exposure and risk assessment is therefore at the heart of all occupational health and industrial hygiene programs. The use of a systematic method to characterize workplace exposures to chemical, physical, and biological agents is a fundamental part of this process. Once a thorough and organized characterization of employee hazard exposures has been completed, occupational health program resources can be more effectively allocated to reduce employee health risks. This includes better focus of training programs, improved execution of medical surveillance programs, effective purchase and implementation of control measures, project and design review, and valuable data for program evaluation.

The SSC Occupational Exposure Assessment and Management Program may also be referred to as the SSC Industrial Hygiene (IH) Program.

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Additional requirements and special topics for the SSC IH Program are contained within:

SCWI-1800-0001, *SSC Ergonomics Program*
SCWI-1800-0003, *SSC Bloodborne Pathogens Control Program*
SCWI-1800-0005, *SSC Hazard Communication*
SCWI-1800-0008, *SSC Reproductive and Developmental Health Protection Program*
SCWI-1840-0001, *SSC Respiratory Protection Program*
SCWI-1840-0002, *SSC Local Exhaust Ventilation for Health Hazard Control Program*
SCWI-8500-0002, *SSC Hearing Conservation*
SCWI-8500-0018-ENV, *SSC Lead and Other Hazardous Coatings Hazard Control Program*
SCWI-8500-0019-ENV, *SSC Asbestos Hazard Control Plan*
SCWI-8500-0029, *SSC Isocyanate Hazard Control Plan*
SCWI-8715-0014, *SSC Heat Stress Program*
SCWI-8830-0002, *SSC Indoor Air Quality Program*

4.0 REFERENCES

Referenced documents shall be the latest edition unless otherwise specified.

American Conference of Governmental Industrial Hygienists (ACGIH), *Guide to Occupational Exposure Values*

ACGIH, *Threshold Limit Values and Biological Exposure Indices*

American Industrial Hygiene Association (AIHA), *The Occupational Environment: Its Evaluation, Control, and Management*

AIHA, *A Strategy for Assessing and Managing Occupational Exposures*

NASA Procedural Requirement (NPR) 1800.1, *NASA Occupational Health Program Procedures*

NPR 1441.1, *NASA Records Management Program Requirements*

Occupational Safety and Health Administration (OSHA) 29 CFR 1910 Subpart Z, *Toxic and Hazardous Substances*

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5.0 RESPONSIBILITIES

5.1 SSC NASA Industrial Hygiene Manager

The SSC NASA Industrial Hygiene Manager (NIHM) shall:

- a. Have overall responsibility for this Stennis Common Work Instruction (SCWI).
- b. Act as liaison between SSC and federal organizations on IH matters.

5.2 NASA and NASA Contractors

NASA and NASA Contractors shall:

- a. Provide support and resources to implement the requirements of this Work Instruction.
- b. Identify and assign an Industrial Hygiene Program Manager (IHPM) with IH responsibilities within the organization.
- c. Prepare written policies and procedures when required to implement IH Program requirements.
- d. Ensure personnel are provided appropriate training and orientation to identify occupational health hazards in their workplaces and the protective measures required for their safety.

5.3 Industrial Hygiene Program Manager (IHPM)

The Industrial Hygiene Program Manager (IHPM) shall:

- a. Implement the requirements of this Work Instruction.
- b. Perform occupational exposure assessments of operations, tasks, or procedures with the potential to expose employees to occupational health hazards for their organization as described in this SCWI and make this information available the NIHM.
- c. Provide to organization representatives, supervisors, and managers the following:
 1. Results of surveys and recommendations,

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- 2. Recommended methods for the elimination or control of occupational health hazards,
- 3. Requirements for employees to participate in a medical monitoring program.
- d. Evaluate employee concerns of potential health hazards.
- e. Provide technical assistance in the selection and design of engineering controls, work practices, and selection of Personal Protective Equipment (PPE).
- f. Serve as a member of the SSC IH and Ergonomics Steering Committee.

5.4 Supervisors

Supervisors shall:

- a. Participate in and coordinate scheduling of occupational exposure assessments.
- b. Implement requirements identified in occupational exposure assessments.
- c. Ensure employees are aware of hazardous materials and physical agents in the work area, understand the requirements for safe work with these materials and agents, and know what actions to take in an emergency.
- d. Contact their IHPM to reassess hazards when operational or process changes are made which may affect employee exposure levels.
- e. Ensure the proper operation and maintenance of engineering controls.

5.5 Employees

Employees shall:

- a. Notify supervisors of areas, operations, or equipment that may be a source of chemical or physical hazards.
- b. Participate in occupational exposure assessments.
- c. Report signs and symptoms of exposure to the supervisor.
- d. Use, maintain, and store PPE as required.

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6.0 OCCUPATIONAL EXPOSURE LIMITS

- a. SSC shall utilize Occupational Safety & Health Administration (OSHA) Permissible Exposure Limits (PELs), Threshold Limit Values (TLVs) issued by the American Conference of Governmental Industrial Hygienists (ACGIH) or specific NASA Health Standards issued by the Office of the Chief Health and Medical Officer (OCHMO). The most protective limit shall be used.

Note: While the OSHA PELs carry the weight of law, the majority of these regulations were adopted in 1970 from 1968 consensus values and most often do not reflect current scientific data. Additionally, there are currently only PELs established for approximately 400 chemicals.

- b. In the absence of a specific PEL, TLV, or NASA Standard, other sources of Occupational Exposure Limits (OELs) shall be utilized. These include the following: (1) The National Institute for Occupational Safety and Health's (NIOSH) Recommended Exposure Limits (RELs); (2) The American National Standards Institute (ANSI) Standards; (3) The National Academy of Science Recommendations; (4) The American Industrial Hygiene Association (AIHA) Workplace Environmental Exposure Levels (WEELs); (5) The Environmental Protection Agency (EPA) Recommendations; (6) The Deutsche Forschungsgemeinschaft (German Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area) Maximum Allowable Concentrations; (7) The British Health and Safety Commission and Health and Safety Executive Occupational Exposure Limits and (8) Chemical manufacturers' recommended exposure values.
- c. When no established OEL exists for a specific chemical, a working OEL shall be established by a competent person based on a thorough examination of the data available for that chemical and by following established industrial hygiene exposure limit setting guidelines. In lieu of establishing a working OEL, the chemical may be banned until an OEL is set by one of the organizations listed above.
- d. Only competent persons that possess the appropriate degree of knowledge, experience, and professional judgment shall establish a working OEL. This process shall take into account chemical analogy, animal experimentation and extrapolation, and human experience and epidemiological data.
- e. SSC shall notify the OCHMO of all newly established OELs. All data used to establish the OEL shall be thoroughly documented. Also, a written rationale that considers, summarizes, and weighs the importance of all data shall be produced. Additionally, experience and professional judgment shall be applied to weigh all information and apply

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an appropriate safety factor, based on the strength of the available data, before an OEL is established.

7.0 QUALITATIVE EXPOSURE ASSESSMENT

A qualitative exposure assessment is an evaluation of potential employee exposure to workplace chemicals, physical, radiological, and/or biological agents based on personal experience and professional judgment.

- a. An exposure assessment shall be initiated whenever a potential hazard is identified as a result of: inspection of workplaces for potential health hazards; review of procedures or operations to identify hazardous materials or physical agents; investigation of complaints of illness or injury that may be work-related; employee reports of potential health hazards.
- b. Once the potential health hazard is identified, the exposure assessment shall be performed. The outcome of this exposure assessment shall be a complete summary of available, essential information on workers, tasks, chemical, physical and biological agents, potential exposures (factoring in frequency and duration), and potential health effects.
- c. Exposure assessments shall be maintained current.
- d. Similar exposure groups (SEGs) shall be created and defined based on the agents and tasks used within that group and the exposure profile to the agents.
- e. A determination shall be made about the acceptability, unacceptability, or uncertainty of the exposure profile defined for each SEG. Uncertain exposures shall lead to further information gathering. Unacceptable exposure shall lead to control of the exposure. Acceptable exposures shall lead to periodic programmed reassessment based on risk.
- f. Exposure groups with unacceptable exposures shall be prioritized and a strategy developed for exposure control.
- g. For the purpose of continual information gathering, SEGs shall be prioritized for additional characterization and to resolve uncertainties. This information may be gathered through quantitative assessments.
- h. A summary strategy for assessing and managing occupational exposure is in Figure 1.

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Occupational Exposure Assessment and Management

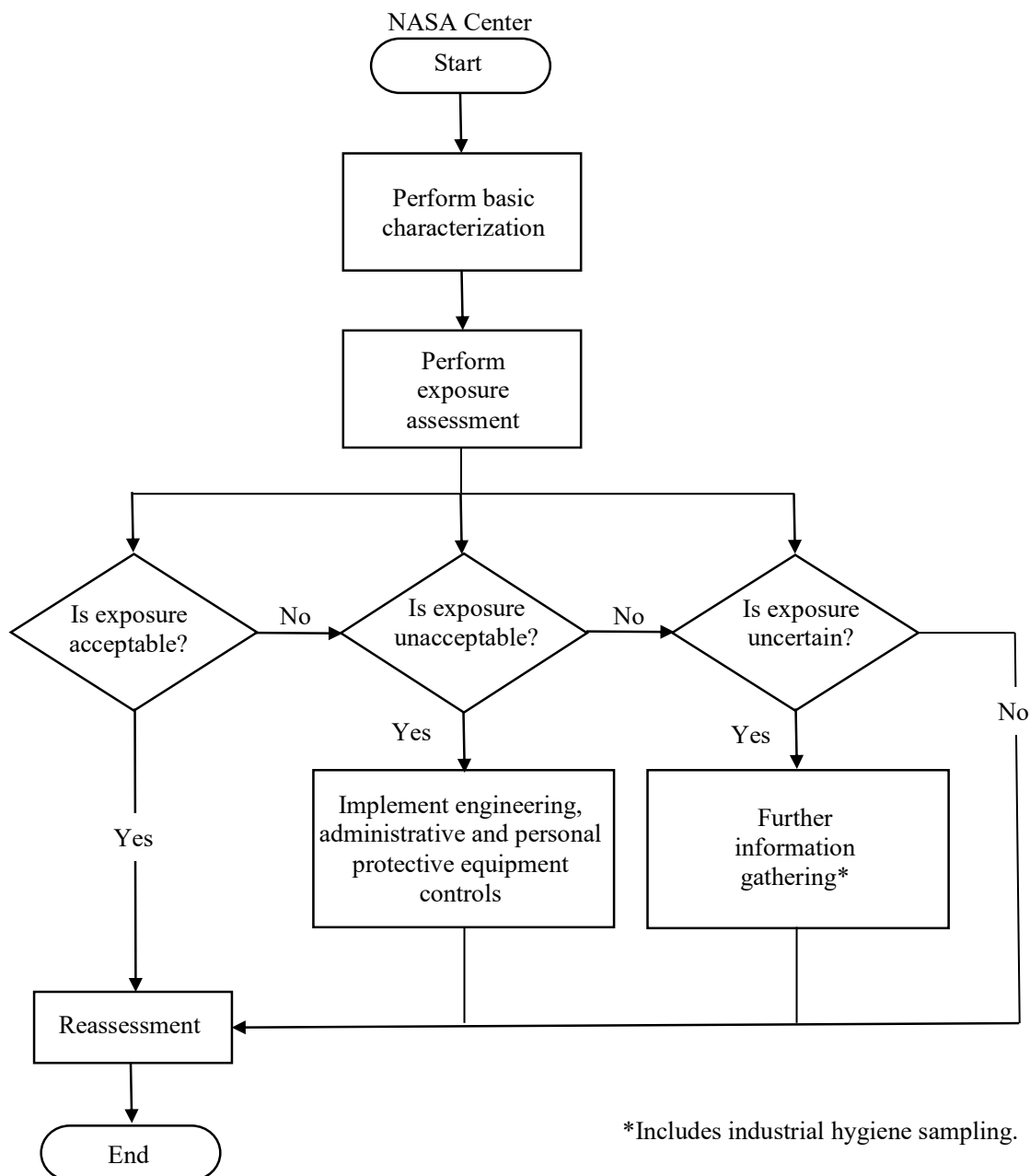


Figure 1. A strategy for assessing and managing occupational exposures (*NPR 1800.1B*).

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8.0 QUANTITATIVE EXPOSURE ASSESSMENT

A qualitative exposure assessment is an evaluation of actual employee exposure to workplace chemicals, physical, radiological, and/or biological agents using accredited numerical and mathematical analysis.

It should be noted not all exposure assessments require collection of quantitative data. If monitoring data is collected, however, the sampling strategy shall be developed in accordance with recognized IH practice, e.g. use of AIHA's "A Strategy for Assessing and Managing Occupational Exposures" to provide exposure data.

8.1 Exposure Monitoring

- Personal breathing zone measurements based on the applicable exposure limit (e.g. 8-hour Time-Weighted Average [TWA] or 15-minute Short-Term Exposure Limit [STEL]) shall be performed and documented.
- When possible, employee exposure monitoring should characterize exposure for similar exposure work groups.
- Exposure monitoring results shall be compared to the applicable exposure standard in accordance with Section 6.0.

8.2 Sampling Requirements

- All IH sampling shall be performed in accordance with the NIOSH or OSHA methodologies.
- Sampling equipment shall be operated according to the manufacturer's specifications.
- Sampling pumps shall be calibrated before and after sampling usage to verify that the flow rate is within sampling specification.
- After the completion of sampling, all samples shall be properly stored in appropriate containers and uniquely labeled.
- Field and lot blanks shall be taken in accordance with NIOSH or OSHA sampling procedures.
- Bulk samples shall be collected in accordance with analytical laboratory requirements.

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- g. Sampling data shall be recorded on a sampling data sheet or directly in the Electronic Health Record System EHRS (See Section 9.0).
- h. When samples are obtained for laboratory analysis, a chain-of-custody document shall accompany all samples. The name of the person who has custody of the samples during the time period from sampling to laboratory receipt must be recorded on the chain of custody.

8.3 Analysis Requirements

- a. Laboratories performing IH sample analyses of employee exposure monitoring shall be accredited by the AIHA.
- b. Asbestos air samples analyzed by Phase Contrast Microscopy (PCM) shall be performed by laboratories accredited by the AIHA or eligible for accreditation by the AIHA.
- c. Asbestos air samples analyzed by Transmission Electron Microscopy (TEM) shall be performed by laboratories accredited by the National Institute of Standard (NIST) for the National Voluntary Laboratory Accreditation Program (NVLAP).

8.4 Report Requirements

- a. Upon completion of exposure monitoring, a report of the findings shall be issued. The report, at minimum, shall include results, methods, interpretation of the results, and recommendations (if applicable).
- b. All employees within an SEG shall be informed in writing of quantitative exposure assessment results.

9.0 ELECTRONIC HEALTH RECORD SYSTEM (EHRS/MEDGATE IH MODULE)

- a. The Electronic Health Record System (EHRS/Medgate IH Module) shall be used to the maximum extent practicable to document exposure assessments.
- b. The EHRS shall be used to record OCHMO defined critical data for samples collected to characterize exposures (e.g., Date, Agent, Results, Center, Sample Type, Jurisdiction, Limit Type, Employer, NASA Employee Type (for onsite as well as offsite), Building/Location, and Process,), as directed.
- c. The EHRS shall also be used as the principal repository for OCHMO defined IH surveys such as ergonomic evaluations, exposure or incident investigations, IAQ surveys, etc.

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10.0 INSTRUMENT SELECTION, CALIBRATION, AND USE

This section establishes procedures for the selection, calibration, and use of instruments utilized for monitoring of health hazards. Monitoring instruments are devices that detect the presence of hazardous materials or physical agents and provide direct measurement of their presence.

10.1 Instrument Selection

- a. Instruments shall be selected based on the specific hazardous material or physical agent to be monitored and the applicable monitoring requirements.
- b. The EHRS shall be used as the principal repository for IH instrumentation inventory records.

10.2 Instrument Calibration

Instrument calibration shall be performed to verify the proper function of the instrument prior to use. The user organization will ensure the following calibration procedures are performed:

1. Instrument calibration shall be performed either in accordance with the manufacturer's instructions or as specified by the calibration laboratory.
2. The manuals and calibration procedures for the instrument shall be provided to the calibration laboratory.
3. The calibration laboratory or the instrument's manufacturer will calibrate the instrument. A calibration sticker with an expiration date will be affixed to the instrument by the calibrating organization.
4. The calibration cycle shall be determined by the manufacturer's recommendations or the calibration laboratory.
5. Calibration records shall be maintained by the calibration laboratory and the user organization.

10.3 Instrument Use

Monitoring instruments shall be used in accordance with the manufacturer's instructions.

The user organization will ensure the following:

1. Operators are trained and qualified to properly operate the monitoring instruments.
2. Instruments shall not be used beyond the calibration expiration date.

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3. The user shall perform a functional check of the instrument prior to each use in accordance with manufacturer's instructions.

11.0 ELIMINATION AND CONTROL OF HAZARDS

Hazard controls are the methods used to eliminate or reduce personnel exposure to hazardous agents. Exposures to hazardous chemicals or agents in the workplace are controlled by the application of one or more of the methods listed below. Hazard controls should be directed first toward eliminating the source of the hazard, second toward the route or path the potential hazard takes, and third toward shielding or protecting personnel who may be subject to exposure to the hazard.

- a. Engineering Controls - The primary method of health hazard control will be through the application of engineering controls. Engineering controls include, but are not limited to, the following:
 1. Substitution to a less hazardous agent or process.
 2. Isolation or enclosure of an operation or process.
 3. Ventilation and air cleaning to remove or reduce air contaminant levels.
- b. Work Practices and Administrative Controls - When workplace health hazards cannot be sufficiently reduced or eliminated by engineering control methods alone, administrative controls must be established. This includes work schedules, procedures, and practices which, when used in conjunction with engineering controls, will minimize worker exposure to hazardous agents. Administrative control measures include:
 1. The use of modified work schedules, medical removal, work limitations, or frequent rest periods to minimize worker exposures.
 2. The use of alternate work procedures that reduce exposures.
 3. Implementation of access controls or clearing of areas to limit the number of personnel with access to a hazardous location.
- c. Personal Protective Equipment (PPE) - PPE is used only when the combination of engineering and administrative control methods are not feasible or insufficient to reduce the hazard to safe levels; or as interim control measures. The use of PPE shall not be considered a substitute for engineering or administrative controls. PPE is intended to shield individual workers from hazardous environments that cannot be reduced or eliminated by any other control methods. PPE includes:
 1. Eye and face protection such as safety glasses, goggles or face shields.
 2. Hearing protection (e.g., ear plugs, ear muffs).
 3. Protective clothing; such as, gloves, aprons, boots, and coveralls.

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4. Protective creams and lotions to minimize skin contact to irritant chemicals.
5. Respiratory protection.

12.0 RECORDS

The following records shall be in accordance with the applicable records keeping requirements of NPR 1441.1:

- a. List of SEGs,
- b. Exposure profiles, and
- c. Judgments of acceptability and certainty.

13.0 DEFINITIONS

Competent Person — A person who has acquired through training, qualification, and experience, the knowledge and skills to identify hazardous materials and/or articles and who has the ability to manage those substances and/or articles that are brought to SSC. This is generally an American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist (CIH).

Employee Exposure — An exposure to chemical, physical, or biological agents that occurs in the workplace regardless of the use of personal protective equipment.

Exposure Assessment — The quantitative or qualitative determination made by an industrial hygienist of an employee's exposure to a chemical or biological agent.

Engineering Controls — Designing out the hazard by process change, substitution of harmful materials, isolation, ventilation, and/or source modification.

Industrial Hygiene — The science of anticipating, recognizing, evaluating, and controlling workplace conditions that may cause workers' injury or illness

Occupational Exposure Limit — A generic term used to represent: 1) the agent concentration or intensity that is allowable based on health effects data, and 2) the period over which one averages workplace concentrations to evaluate whether the measured concentrations are less than the allowable limit.

Similar Exposure Group — A group of workers having the same general exposure profile for the agent(s) being studied because of the similarity and frequency of the tasks they perform, the materials and processes with which they work, and the similarity of the way they perform the tasks.

Toxicity — Relative property of a chemical agent that refers to the harmful effect it exerts on some biologic mechanism and the conditions under which the effect occurs

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14.0 ACRONYMS

ABIH	American Board of Industrial Hygiene
ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
CIH	Certified Industrial Hygienist
IH	Industrial Hygienist
NASA	National Aeronautics and Space Administration
NIOSH	The National Institute for Occupational Safety and Health
NIHM	National Industrial Hygiene Manager
NIST	National Institute of Standards and Technology
NPR	NASA Procedural Requirements
NVLAP	National Voluntary Laboratory Accreditation Program
OCHMO	Office of the Chief Health and Medical Officer
OEL	Occupational Exposure Limits
OSHA	Occupational Safety and Health Administration
PCM	Phase Contrast Microscopy
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
SCWI	Stennis Common Work Instruction
SEG	Similar Exposure Group
SSC	Stennis Space Center
STEL	Short-Term Exposure Limit
TEM	Transmission Electron Microscopy
TLV	Threshold Limit Value
TWA	Time-Weighted Average